International, Space, and Response Technologies Division
Space and Atmospheric Sciences (ISR-1)
P.O. Box 1663 – MS D466
Los Alamos, New Mexico 87545
(505) 667-1210/Fax (505) 665-7395

March 19, 2004
ISR-1-04-027

Dr. Andrew Christensen
Northrop Grumman Space Technology
One Space Park, R9-1914
Redondo Beach, CA 90278

Dear Andy,

The Sun-Earth Connections Advisory Subcommittee met in Washington on March 10-12. We had a very full agenda, a copy of which is attached to this letter. We appreciate the informative presentations we heard, and we are particularly grateful to Ed Weiler and other Headquarters personnel for taking the time to be with us.

As you are well aware, the OSS portion of the recently released President's FY05 budget request contained some big changes from the budget that emerged from the extensive strategic planning process NASA has pursued for a number of years. The impact of these changes is particularly severe for the SEC and SEU themes, and much of our discussion was aimed at trying to understand the consequences for the SEC program and what actions might be taken to alleviate some of the problems.

To illustrate the level of impact on SEC programs, here are the ratios of funding proposed for certain program areas in the President's FY05 budget request, relative to what was submitted by NASA to OMB in the fall of 2003 for the same categories:

Program Area	FY05	FY06	FY07	FY08	FY09
MO&DA	1.0	0.95	0.83	0.78	0.74
Rocket Ops	0.95	0.83	0.77	0.74	0.74
Explorers	0.42	0.68	0.50	0.86	0.99
Solar-Terrestrial Probes	0.22	0.18	0.25	0.54	0.51

SECAS is greatly concerned that this budget, if realized, would damage a healthy, productive, and popularly-valued part of its exploration mandate, namely the SEC science program. Thus, you will see that several of the SECAS findings detailed and summarized in the attachments are intended to call attention to the impact of the proposed budget and to request assistance in ameliorating some of the most severe consequences. Our other findings propose actions that can be taken in light of the proposed budget to rescue important near-term science opportunities.

An Equal Opportunity Employer / Operated by the University of California for the
National Nuclear Security Administration of the U.S. Department of Energy

SECAS welcomes the upcoming roadmap process as an opportunity to clarify the vital role of SEC science in fulfilling the nation's vision for the exploration of the solar system and beyond.

Our specific findings and a brief summary thereof are attached.

Best regards,

Michelle F. Thomsen
SECAS chair

cc Dr. Richard Fisher

attachments

SECAS Findings from 10-12 March 2004 Meeting
Summary of SECAS Findings
Agenda for 10-12 March 2004 SECAS Meeting

SECAS Findings from 10-12 March 2004 Meeting

1) *SEC and the Presidential Vision for Exploration*

SECAS is pleased that the value and importance of space exploration have been acknowledged at the highest levels of our government. We believe that the nation is well served by a vigorous program to explore and understand our space home and the wider universe beyond. However, we are greatly concerned that an overly narrow interpretation of "exploration" will seriously affect the current vibrant and productive exploration programs in SEC and SEU. A vital program of scientific exploration is needed both to support human exploration and to advance our knowledge of space and the fundamental processes that operate throughout the solar system and beyond. The business of the SEC theme is exactly such exploration. Planned SEC missions and programs systematically probe regions of space and physical processes throughout the solar, heliospheric, planetary and Geospace environments. SEC explores the inter-relationships that exist within the coupled solar-planetary system, and SECAS believes that this science is essential to realizing the newly enunciated vision of exploration.

Based on the President's proposed FY05 budget allocations, SECAS is concerned about the future of the SEC science enterprise. The proposed budget includes large reductions in the planned funding for the Solar Terrestrial Probes line, the Explorer line, the Sounding Rocket and Research and Analysis programs, and Mission Operations, even though these programs have been repeatedly studied, endorsed by the National Academy of Sciences and strongly supported by the space science community. If this budget is realized, it will lead to shortfalls in scientific progress, lack of synergy between the program elements, missed opportunities, and deterioration of the research base. Beyond this, there are wider impacts, including a weakening of US leadership in space sciences. Lost will be carefully planned, valuable contributions to society, technology, national security, and to the goals of exploration.

Nowhere are these potential impacts more evident than in the de-emphasis of the Solar Terrestrial Probes line. As an illustration, consider the status of our understanding of the role of magnetic fields and magnetic energy release throughout the solar system. Energy is stored in magnetic fields by the solar dynamo and subsequently released and converted into heat, flows and radiation. High-energy particles and massive ejections of solar material can accompany magnetic energy conversion on the sun, leading to great changes in interplanetary conditions, to magnetospheric storms, and to dangers to technological assets and human activity in space, as well as other possible effects not yet discovered. Understanding how these fundamental and ubiquitous processes work is a crucial and intellectually challenging underpinning to exploration of the solar system and beyond. However, the only possibilities in the foreseeable future to directly investigate magnetic energy release and its consequences are found in the near-Earth environment. Through a carefully planned and overlapping sequence of STP missions, SEC will first directly explore the physics of the flow of energy in the terrestrial magnetosphere (the MMS mission), then will examine the global consequences for the magnetospheric system (the MagCon mission), and finally will elucidate the implications for the Geospace environment (GEC mission). Under the President's proposed budget, these missions are delayed such that only the first one even appears on the horizon. We believe that this slow-down does major damage to NASA's space science program by curtailing the access to space for missions aimed at exploring the fundamental nature of the universe in which we live. It also indirectly affects our ability to address some of the crucial societal impacts of space weather since STP science (such as magnetic reconnection) forms part of the underpinnings of Living With a Star research. We conclude that the essential STP line should be restored to its carefully planned and integrated schedule as soon as possible.

A robust program of fundamental space science objectives is necessary to achieve the goals of the new exploration vision. SECAS believes that our ability to support this vision

requires a breadth in SEC missions, including both a discipline balance and a balance between small, medium and large missions. We also believe that the process of revising program priorities would greatly benefit from input from the science community. NASA has a responsibility to carry out appropriately motivated basic research. We therefore urge NASA and SEC to firmly maintain NASA's longstanding commitment to understand the space environment, supporting a robust SEC program including the foundational STP line.

2) *Operating Missions: A Distributed SEC Observatory*

SECAS notes that the fourteen currently operating satellites of the Sun-Earth Connection Division span the solar system from the Sun and near-Sun interplanetary medium to the edge of the Heliosphere, and near Earth from the top of the atmosphere to the top of Geospace. This fleet of spacecraft is unprecedented in the quality and breadth of data being gathered, returned, and analyzed, enabling for the first time the pursuit of a complete picture of the sun and its relationship to the planetary system. For example, these satellites, and those at Mars, chronicled the violent October-November 2003 solar eruptions as they wreaked havoc throughout the solar system. Without these complementary satellite assets, our exploration of the coupled Sun-planetary system would be greatly compromised, as would be our ability to support future human and robotic exploration of the Moon, Mars and beyond.

SECAS views with concern the prospect that budgetary impacts to the MO&DA, Supporting Research and Technology, and Guest Investigator programs will result in the loss of significant key elements of this unique flotilla of space explorers at a time of increasing need to understand the effects of solar variability throughout the solar system. The scientific value of the fleet cannot be overemphasized. The costs to operate it at full capacity pale in comparison to replacement costs. Once lost, these capabilities cannot be re-established without significant expenditures. The new missions planned for future years will add capabilities in key areas but will not replace those that already exist in the current operating satellites. Thus, every possible effort must be made to exploit the nation's investment in these assets for continued exploration of the sun's influence throughout the solar system.

SECAS urges SEC to consider innovative ways to sustain this irreplaceable portfolio of extended missions and the science activities that utilize their observations. If NASA deems it necessary, we also support an early Senior Review to reorder priorities to make most effective use of this coordinated capability.

3) *Restoring a Healthy Sounding Rocket Program*

The sounding rocket program, like the Explorer program, makes crucial and productive contributions to NASA's mission of discovery and exploration. From the earliest discoveries of space exploration to those of today, sounding rockets provide a mechanism for cutting-edge science, the only access to certain regions of space, the fastest and most cost-effective access to space, and an irreplaceable opportunity for training space scientists and developing and testing instrumentation. For more than a decade, the sounding rocket operations and science budgets have been inadequate. The recent National Academy of Sciences decadal survey recognized the value of this program to the nation and recommended increasing the funding level to bring the program back to health. The President's proposed FY05 budget freezes the sounding rocket operations budget at roughly the current level for five years, losing sight of this NAS recommendation and forcing a choice between falling behind in technology and inventory or halving the flight rate. Either choice brings negative long-term consequences for space science in terms of scientific achievement, instrument development, and training of scientists and engineers required for future space exploration.

In the short term, SECAS urges that the funding for this essential infrastructure and science program be restored to the previously planned levels. In addition, SECAS supports the ongoing

activity of a task force that has been created to chart the future direction of the sounding rocket program. This task force will be consulting with stakeholders in the program to identify needed developments and the most productive path for the future.

4) *Explorer AO for Missions of Opportunity*

Explorer missions are meant to provide frequent and rapid access to space for investigations to address compelling science questions. The SEC community places a very high priority on Explorer missions because they allow us to respond quickly to new scientific and technological developments and they support the future vitality of the field by providing a competitive opportunity for young experimentalists and developing groups. The major reduction in funding for the Explorer line in the proposed FY05 budget will translate into a significant delay in the development of future Explorer missions. SECAS therefore endorses the idea of releasing as soon as possible an Explorer Announcement of Opportunity (AO) that solicits only Missions of Opportunity (MOs). This AO, replacing this year's postponed full MIDEX AO, would potentially allow the recovery of some near-term science returns without making a large impact on the Explorer budget or out-year flight cadence. It also would provide impetus to the science community to keep considering new ideas in the upcoming period of limited opportunities. The understanding of the committee is that such an AO could be released with a relatively modest amount of effort by Headquarters staff in a reasonably short time interval (a few months). Furthermore, the committee expresses its desire that proposals tendered in response to this special opportunity be evaluated against the same quality standards already established for Explorer MOs.

5) *Future Prometheus Missions*

SECAS was very interested in presentations of the Prometheus Project and Solar System Exploration Program by Ray Taylor and Orlando Figueroa, and we greatly appreciate additional SEC representation on the Prometheus MOWG, as suggested in our previous letter (November 11, 2003). SECAS continues to be extremely supportive of the developments in the Prometheus Project, which will benefit an array of notional missions that need dependable, cost-effective and/or long duration nuclear propulsion. We also applaud the plan for an upcoming workshop to consider candidate Prometheus missions to follow the Jupiter Icy Moons Orbiter (JIMO). Such a workshop begins a prioritization process that must engage all relevant divisions in the Office of Space Science. One mission that we particularly hope will receive attention is Interstellar Probe (IsP), which has consistently received the highest scientific ratings but was deferred in the NAS Decadal Survey as a high-priority flight mission because advanced propulsion developments are needed to accomplish it. IsP embodies the spirit of the President's Exploration Vision by exploring the limits of the solar system and galactic medium beyond.

6) *Continued Support for Solar Probe*

SECAS reiterates its previous support for a Solar Probe mission. Solar Probe will provide the first opportunity to explore the region of space very near the Sun (to 0.02 AU), including studies of magnetic fields, coronal heating, and particle acceleration at the Sun. SECAS recommends that this mission be funded and implemented at the earliest possible opportunity. Solar Probe is clearly strongly aligned with the objective to explore the solar system outlined in the President's vision for space exploration. The strategic importance of this mission is underscored by the high rating given to Solar Probe in the most recent NAS Decadal Survey. In addition, the understanding of solar energetic particle acceleration obtained from this mission will be important for future manned missions by providing insight into one of the hazards faced by humans in space.

Summary of SECAS Findings

1) *SEC and the Presidential Vision for Exploration*

Issue: Based on the President's proposed FY05 budget allocations, SECAS is concerned about the future of the SEC science enterprise.

Background: A vital program of scientific exploration is needed both to support human exploration and to advance our knowledge of space and the fundamental processes that operate throughout the solar system and beyond. The business of the SEC theme is exactly such exploration, but the President's FY05 budget request includes large reductions in the planned funding for the Solar Terrestrial Probes line, the Explorer line, the Sounding Rocket and Research and Analysis programs, and Mission Operations. We believe that this budget will lead to shortfalls in scientific progress, lack of synergy between the program elements, missed opportunities, and deterioration of the research base.

Subcommittee recommendation: SECAS urges NASA and SEC to firmly maintain NASA's longstanding commitment to understand the space environment by supporting a robust SEC program, including in particular the foundational STP line. Therefore, we recommend that budget priorities be reexamined and that the essential STP line be restored to its carefully planned and integrated schedule.

2) *Operating Missions: A Distributed SEC Observatory*

Issue: Budgetary impacts to the MO&DA, Supporting Research and Technology, and Guest Investigator programs threaten to result in the loss of significant key elements of the unique flotilla of existing satellites at a time of increasing need to understand the effects of solar variability throughout the solar system.

Background: The fourteen currently operating satellites of the Sun-Earth Connection Division span the solar system from the near-solar interplanetary medium to the edge of the Heliosphere, and near Earth from the top of the atmosphere to the top of GeoSpace. This fleet of spacecraft is unprecedented in the quality and breadth of data being gathered, returned, and analyzed, enabling for the first time the pursuit of a complete picture of the sun and its relationship to the planetary system. The scientific value of the fleet cannot be overemphasized. Once lost these capabilities cannot be re-established without significant expenditures. Every possible effort must be made to exploit the nation's investment in these assets for continued exploration of the sun's influence throughout the solar system.

Subcommittee recommendation: SECAS urges SEC to consider innovative ways to sustain this irreplaceable portfolio of extended missions and the science activities that utilize their observations. If NASA deems it necessary, we also support an early Senior Review to reorder priorities to make most effective use of this coordinated capability.

3) *Restoring a Healthy Sounding Rocket Program*

Issue: The President's proposed FY05 budget freezes the sounding rocket operations budget at roughly the current level for five years, bringing negative long-term consequences for space science in terms of scientific achievement, instrument development, and training of scientists and engineers required for future space exploration.

Background: The sub-orbital program provides an essential mechanism for cutting-edge science, the only access to certain regions of space, the fastest access to space, and an irreplaceable opportunity for training space scientists and developing and testing instrumentation. For more than a decade, the sounding rocket operations and science budgets have been inadequate. The recent National Academy of Sciences decadal survey recognized the value of this program to the nation and recommended increasing the funding level to bring the program back to health.

However, the recently proposed FY05 budget would make this dire situation even worse, forcing a choice between falling behind in technology and inventory or halving the flight rate.
Subcommittee recommendation: SECAS has on several occasions expressed its support for a strong sounding rocket program and now urges that the funding for this essential infrastructure and science program be restored to the previously planned levels. In addition, SECAS supports the ongoing activity of a task force to chart the future direction of the sounding rocket program, including consultations with stakeholders to identify needed developments and the most productive path for the future.

4) *Explorer AO for Missions of Opportunity*
Issue: The major reduction in funding for the Explorer line in the proposed FY05 budget will translate into a significant delay in the development of future Explorer missions. Some near-term science return could be recovered by issuance of an Explorer AO soliciting only Missions of Opportunity.
Background: Explorer missions are meant to provide frequent and rapid access to space for investigations to address compelling science questions. In the face of major proposed cuts to the Explorer budget, the release of an Explorer Announcement of Opportunity (AO) that solicits only Missions of Opportunity (MOs) would potentially allow the recovery of some near-term science returns without making a large impact on the Explorer budget or out-year flight cadence. It also would provide impetus to the science community to keep considering new ideas in the upcoming period of limited opportunities.
Subcommittee recommendation: SECAS endorses the idea of releasing as soon as possible an Explorer Announcement of Opportunity (AO) that solicits only Missions of Opportunity (MOs). Furthermore, the committee expresses its desire that proposals tendered in response to this special opportunity be evaluated against the same quality standards already established for Explorer MOs.

5) *Future Prometheus Missions*
Issue: There is continued SEC interest in the Prometheus program and mission concepts enabled by it.
Background: SECAS heard presentations of the Prometheus Project and Solar System Exploration Program by Ray Taylor and Orlando Figueroa, and we greatly appreciate additional SEC representation on the Prometheus MOWG, as suggested in our previous letter (Nov 11, 2003). We were pleased to hear of plans for an upcoming workshop to consider candidate Prometheus missions to follow the Jupiter Icy Moons Orbiter (JIMO). Such a workshop begins a prioritization process that must engage all relevant divisions in the Office of Space Science. One mission that we particularly hope will receive attention is Interstellar Probe (IsP).
Subcommittee recommendation: We continue to be supportive of the Prometheus Project, and we applaud plans for a post-JIMO mission candidate workshop, where we urge consideration be given to the merits of the Interstellar Probe mission.

6) *Continued Support for Solar Probe*
Issue: SECAS strongly endorses the Solar Probe mission to explore the Sun. This mission is well-aligned with the President's goal of solar system exploration.
Background: Planning for the Solar Probe mission has been ongoing for more than 20 years. Despite the compelling nature of studying the central object of the solar system, funding for a flight opportunity has not been found. The basic science is important for our understanding of processes at the Sun and in the solar system, some of which lead to hazards for humans in space.
Subcommittee recommendation: SECAS recommends that the Solar Probe mission be funded at the earliest possible opportunity.

AGENDA - SECAS - MARCH 10-12, 2004
NASA HEADQUARTERS – 9H40

WEDNESDAY, 10 MARCH 2004

0815	Meeting Room Open, Coffee	
0830	Welcome	Michelle Thomsen
0840	Prefatory remarks	Dick Fisher
0900	New space policy, budget, OSS priorities	Ed Weiler
1000	Break	
1015	New space policy, budget, SEC perspective	Dick Fisher
1115	Solar System Exploration	Orlando Figueroa

1200	Break for lunch	

1315	MOWG reports SH Geospace LWS	 Dana Longcope Jim Clemmons Dan Baker
1400	FY05 Budget Impact on the Operating Missions	Chuck Holmes
1430	Explorer Program	Paul Hertz
1500	Explorer Program Discussion	Committee
1530	Break	
1545	JIMO and Prometheus, Code T	Ray Taylor
1615	Sounding Rocket Operations	Mary Mellott
1645	Discussion	Committee
1730	Adjourn	

THURSDAY, 11 MARCH 2004

0815	Meeting Room Open, Coffee	
0830	Update on previous SECAS findings	Dick Fisher/Barbara Giles
0845	Summary of Missions in Development/Operation	Chuck Gay
0900	Roadmap/2006 Strategic Plan 2006 Process (30min) Insights from the 2003 Process (30 min) Update on Status of Roadmap Missions (20 min) Discussion (25 min)	 Marc Allen Fuselier/Spence Neil Murphy Committee
1045	Break	
1100	Discipline Scientist Reports (10 min each) GEC – Phil Richards Solar Orbiter – Todd Hoeksema LWS Geospace Missions – Barbara Giles Magnetosphere Constellation – Bill Peterson Discussion on Panel Review Issues	

1200	Catered lunch in HQ 9H40/Science presentation Marty Mlynczak (NASA/LARC): The Solar Storms of 2002 and 2003: Upper Atmosphere Response and Speculations on Their Influence on Climate

THURSDAY, 11 MARCH 2004 … continued

1345	LWS	
	IRT/Non-Advocate Review	Dana Brewer
	Update (inc. Solar Probe), Actions on previous findings	Lika Guhathakurta
	ILWS	Lika Guhathakurta
1500	Break	
1515	Discipline Scientist Roundtable	
1545	Committee Discussion and Writing Assignments	Committee
1700	Adjourn	

FRIDAY, 12 MARCH 2004

0815	Meeting Room Open, Coffee	
0830	Committee Writing Time	
0930	Review Findings	
1030	Break	
1045	Review Findings with Dick Fisher	
1200	Adjourn	

END OF MEETING